Methods for researching and building capacity in codesign among non-experts

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Methods for researching and building capacity in co-design among non-experts

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The paper presents two case studies of methods that were used in practice with non-expert co-design groups. The methods draw on asset-based community development principles to fulfil a two-fold objective: first, to study co-design (derive knowledge *about* co-design), and second, to support co-design practice by building the capacity of those groups to carry out design tasks. The paper discusses how the two objectives are met in each case, and derives some general observations about co-design practice in the context of non-expert groups and the capabilities that need to be supported or nurtured. The paper contributes to the development of design research methods that have an impact on societal change.

Keywords: co-design, asset based community development, design capacity

1 Introduction

Designers and design researchers have been developing new approaches and practices seeking to involve a wide range of people in design and design research as a means of affecting positive changes at a human, social, political, and environmental level. Under the rubric of co-design lay a broad spectrum of practices where people work together or connect their knowledge, skills and resources in order to carry out a design task. In such practices, designers and other partners (users or stakeholders) come together, ideally at all stages of a design process: to explore and make sense of their situation (their needs, resources and objectives), to creatively generate and develop ideas and, increasingly, to also 'produce' design solutions in order to realise an imagined better future. As Brandt et al (2013) discuss, such activities are often supported by design tools and techniques which must be developed and used with respect to their particular context and by adopting a particular mindset to make them valuable to participants and accommodate multiple voices.

This paper is focussed on a particular species of tools and methods, which are both tools for research about design, as well as tools for building participants' capacity to co-design. For the purposes of this paper, co-design capacity is defined as the capacity of a group of people to carry out a design task: that is, as posited above, to make sense of their current situation, imagine a better future and take steps to realise it. To make the focus of this paper and its contribution clear, it is important to clarify two elements: a) what we mean by tools for research about design and b) what we mean by participants.

Since the first efforts to establish design research as a distinct type of intellectual enquiry in the 1960s, there has been a realisation that 'research' and 'design' interact at multiple levels (e.g. Rogers and Yee, 2015). Cross (2001) for example, discussed different ways in which 'science' (scientific research) interacts with design (i.e. scientific design, design science and science of design) and proposed (Cross, 1999) that design research can fall into three categories based on whether the focus is placed on the study of people, processes, or products (design epistemology, design praxeology, and design phenomenology). Jonas (2013) built on Frayling's (1993) categorisation of design research to introduce four modes of design research: research *for* design (research aimed at improving design), research *about* design (research aimed at understanding different aspects of design), research *through* design (research conducted through active participation in design) and research *as* design (research performed in the medium of design, abductively). Research as design is intrinsically about design as a distinct knowledge production activity, and can be embedded or interact with other types of research.

The majority of tools and techniques used by designers focus on involving people in research *for* and research *through* design. Research for design aims to help better understand and cater for their needs, values and preferences (as is typical in user research or ergonomics). Research *through* design has different facets. One type of research through design focusses on using design tools and processes in order to explore wider questions about society, technology and the environment (e.g. Dunne and Raby, 2013). In co-design, which is the field of relevance here, the focus is often on engaging people (users, stakeholders) more meaningfully in the design process, to elicit their complementary knowledge and expertise and utilise their creative capacity (e.g. Sanders and Stappers, 2012). In such studies we have an overlap between research *through* and research *for* design, as active participation in design has the ultimate aim or output to create innovative design products or services.

However, there is much less research in co-design which seeks to derive knowledge *about* design. The present paper focusses on studies that seek to derive knowledge about co-design. However these studies incorporate research *for* and *through* design as well, as they aim to support co-design practice through the medium of design (through design tools).

The second defining characteristic of this paper is that it focusses on cases where design is carried out by people who are *not trained in design* (for simplicity we will call them non-experts, although they may hold valuable expertise related to the design task at hand). By this we do not mean design students, but self-defined groups of people who wish to undertake design projects (e.g. communities of place or interest, civil society groups or activists). Those non-experts are the co-design participants we talk about in the paper. Note that in the studies that will be presented, the academic researchers (and authors of this paper) acted as facilitators or enablers of the design process, and the co-design participants were also participants in the research.

Having clarified these terms, it is now possible to specify the aim of the paper. The aim is to present and discuss a set of tools and methods used in practice with non-expert design groups with the two-fold objective to first, facilitate co-design and build the capacity of these groups to carry out design tasks, and second, to study co-design practices. We discuss advantages and limitations of those tools and outline key insights about co-design activity in

this context. We hope that sharing our learning about the particular tools and how they can be used in different settings can help inform future practice.

2 Context

2.1 Understanding co-design practices of non-expert groups

Co-design practices have their roots in ground breaking initiatives in the 1960s and 1970s associated with a quest for more equitable, democratic, and sustainable design solutions (Wates and Knevitt, 1997; Sanoff, 1999; Gregory, 2003; Ehn et al, 2014). Research in co-design entails a variety of practices adhering to different principles and traditions (see Zamenopoulos and Alexiou, 2018 for a comprehensive review). Progressively over the years, the engagement of everyday people in creative and design practices has become more direct: design activism, Do-it-Yourself practices and social entrepreneurship have emerged as important practices associated with the broader term 'social design' and 'creative citizenship' (see e.g. Manzini, 2015; Hargreaves and Hartley, 2016). Such practices are thought to disrupt existing norms and values, offer new ways of inhabiting and experiencing reality and provide innovative solutions that at the same time meet social needs and create new or stronger social relations. While a lot of research has focussed either on practices led by professional designers or projects initiated through research, the focus of this paper is on pre-existing groups who already work or have a design project in the making. Typical examples include groups who self-organise to design and provide a new local service, neighbourhood forums and neighbourhood planning groups, or groups that take over the development of an existing building or open space. The present paper is part of a research programme that aims to better understand how those practices are born and operate, and the conditions (human, economic, social) that make them possible.

2.2 Developing design capacity

Support for creative citizen or self-organised co-design groups that comes from regional and national government (at least in the UK), often focusses on funding/fundraising advice, business development and project management, while design capacity is customarily injected in the form of expert advice. Additionally, while changes in legislation may fundamentally provide rights for citizens to engage in design activities, legislations and laws on their own cannot guarantee a capacity to do so.

Here we take inspiration from community development (particularly asset-based community development) practices to focus on unearthing the intrinsic resources and capacities that people have and that can be mobilised and nurtured to carry out projects.

Rather than focusing on deficits or things that are missing, asset-based approaches suggest that community groups will be better equipped to develop their projects if they can identify and mobilise the assets they already have (Kretzmann et al, 2005). The term assets includes tangible resources such as spaces, services and infrastructures, but also intangible resources such as creative talents, skills, knowledge, emotions, values and social relationships. O'Leary et al (2011) categorise assets under seven categories ('Seven capitals'), three tangible: Financial, Built and Natural, and four intangible: Human, Social, Cultural and Political. They emphasise the importance of intangible assets and their role in helping to strengthen and better use other types of assets, such as buildings or financial capital. In contrast to tangible assets, which are more easily recognised and more likely to be already utilised effectively by communities, intangible assets often remain unrecognised

and unrepresented. Thus they can be identified as the main carriers of untapped potential and value.

The case studies presented in this paper examine the development and use of tools/approaches that can help elicit and mobilise assets as a means of developing the capacity of groups to carry out their design task.

2.3 Tools and techniques for design research

As discussed, the paper is concerned with tools and methods used to conduct research *through,* research *for* but also research *about* design. The use of creative and engaging objects, techniques and toolkits is becoming an integral part of any type of design research, so in order to clarify the focus of this paper, it is useful to briefly examine some existing categories of tools and terms used and discern similarities and differences.

Sanders and Stappers (2012) presents a number of different tools and mechanisms which support engagement in design research. These tools and mechanisms are thought to facilitate broadly the acts of making, telling and enacting (Brandt et al, 2013). Sanders and Stappers (2014) identify and discuss three key approaches: probes, toolkits and prototypes. Cultural probes were introduced by Gaver et al (1999) as a way to provoke inspirational responses from users and usually consist in a collection of objects such as maps, instant cameras, or postcards. The original articulation of probes aimed to realise an alternative 'designerly' mode of conducting research (research as design) that values uncertainty and provokes subjective interpretation (Gaver et al, 2014). Later realisations of probes include empathy probes, value probes and technological probes (see Mattelmäki, 2005; Madden et al, 2014;). Based on a review of the literature and exploration of the different ways probes have been used, Mattelmäki (2005) suggests that probes can be used for four reasons: inspiration, information, participation and dialogue. Beyond inspiration, probes can help elicit user perspectives, and they can support dialogue and collaboration, empowering users to participate in innovation. Comparing probes to generative toolkits Sanders and Stappers (2014, pp 8) purport that a main difference is that generative toolkits are used as part of 'a more deliberate and steered process of facilitation, participation, reflection, delving for deeper layers in the past, making understanding explicit, discussing these, and bridging visions, ideas and concepts [scenarios] for the future.' Additionally, while probes tend to be used individually by users on their own, toolkits tend to be used as part of a facilitated collaborative process (where users participate either individually or in small groups). Prototypes are quite different from probes and toolkits as they are used to physically represent ideas or concepts, to communicate those ideas and to explore their 'technical and social feasibility'. Between probes, toolkits and prototypes, exist other approaches. Examples include games (Brandt, 2006) which engage participants in a playful way by using a set of rules and tangible objects, and which are thought to be useful in staging participation and aiding exploration of relevant issues to feed into design work; and provotypes (provocative prototypes) (Mogensen, 1994; Boer and Donovan, 2012) which focus on revealing conflicts between different stakeholders in a participatory innovation process, and may be used at the beginning of the process to stimulate generation and exploration of ideas.

In this paper we focus on approaches that, similarly to toolkits, are used to support co-design (particularly at the early phases, helping to delve into the past, identify current issues of concern and explore ideas for the future). However, they are also specifically designed so as to collect information not (only) about the task in hand, but also about the very process of co-

design and the things that enable or inhibit it. Reflecting on the information collected can help progress design in the particular context, but analyzing information collected through multiple applications of the approach in different contexts, can help generate knowledge about design more generally.

As the terminology used to discuss different approaches (e.g. tools, techniques) is often confusing it is useful to consider some definitions proposed by Sanders et al (2010). According to their proposal, tools are the material components used in activities, whereas toolkits are collections of tools used together. A technique is how the tools and toolkits are put into action (e.g. classification, collaging) and a method is a combination of tools, toolkits and techniques that are strategically put together to address defined goals with a research plan. An approach is a more encompassing term, that describes the overall mindset of a research plan. The paper focusses on methods (and associated toolkits and techniques) that adopt an asset-based approach to co-design. These methods however are not rigid; they can and have been adapted for application in different contexts (and for specific purposes).

3 Case studies

The paper presents two case studies of methods that were developed and used with a number of different co-design groups. The first, called Asset Mapping was developed (in collaboration with colleagues at the Helen Hamlyn Centre) as part of a project called Creative Citizens which aimed to explore the potential of media (particularly social media) to support creative citizens across various domains of practice. The method was applied across all three strands of work of the project in the UK, led by different community-academic partnerships: among hyperlocal journalists; creative network participants; and community groups involved in place-making projects (nine groups in total). All groups who undertook the asset mapping exercise in this case went on to design and produce media interventions to suit their purposes. Examples include a ‘printervention’, a digital storytelling site, a graphic novel and online planning consultation sites. The second method, called Challenges-Assets-Opportunities was developed as a part of a project called Empowering Design Practices which aimed to explore how community-led design can be enabled among groups who look after historic places of worship. The approach in this case was used with groups thinking about changes to their building in order to ensure its sustainability and widen its role as a community resource. The results discussed here focus primarily on the application of the method with eight groups looking after churches in England, UK who took part in a workshop using the approach for the first time.

3.1 Asset Mapping

The asset mapping method was developed by building upon a number of existing approaches (Guintoli et al, 2012; Kretzmann et al, 2005; O’Leary et al, 2011; Mathie and Cunningham, 2002; Rowson et al, 2010), and by consulting with different practitioners and experts. This was followed by a period of experimentation where various versions were piloted and tested with different groups. Amendments took into consideration the need for flexibility (so that the approach can be used in a variety of community settings), practicality (taking into consideration the needs and the time limitations of community participants), and observability (the need to be able to document observations and outcomes for further detailed analysis).

As discussed, the approach was based on asset-based community development (ABCD) principles however is distinctive in that it has a dual purpose (to support research and co-design). This meant both a focus on helping capture tangible and intangible assets that could be used to achieve the objectives of each group, as well as their perceptions of these assets as narrated and negotiated between participants. To support co-design among non-experts the method was also intentionally developed similar to a game so that they can engage creatively and in an intuitive or playful way.

The method uses the following tools: a map with circles drawn around a central point and six stacks of objects (props), each representing a different category of assets. The six asset categories were: spaces (built or open), people (including roles, skills or capabilities), infrastructures (such as transportation), groups and businesses (public, private and civil society organisations operating at local and national level, clubs, networks etc), media (online and offline) and other (for anything that doesn't fit into the other categories, such as cultural events, values, emotions etc).

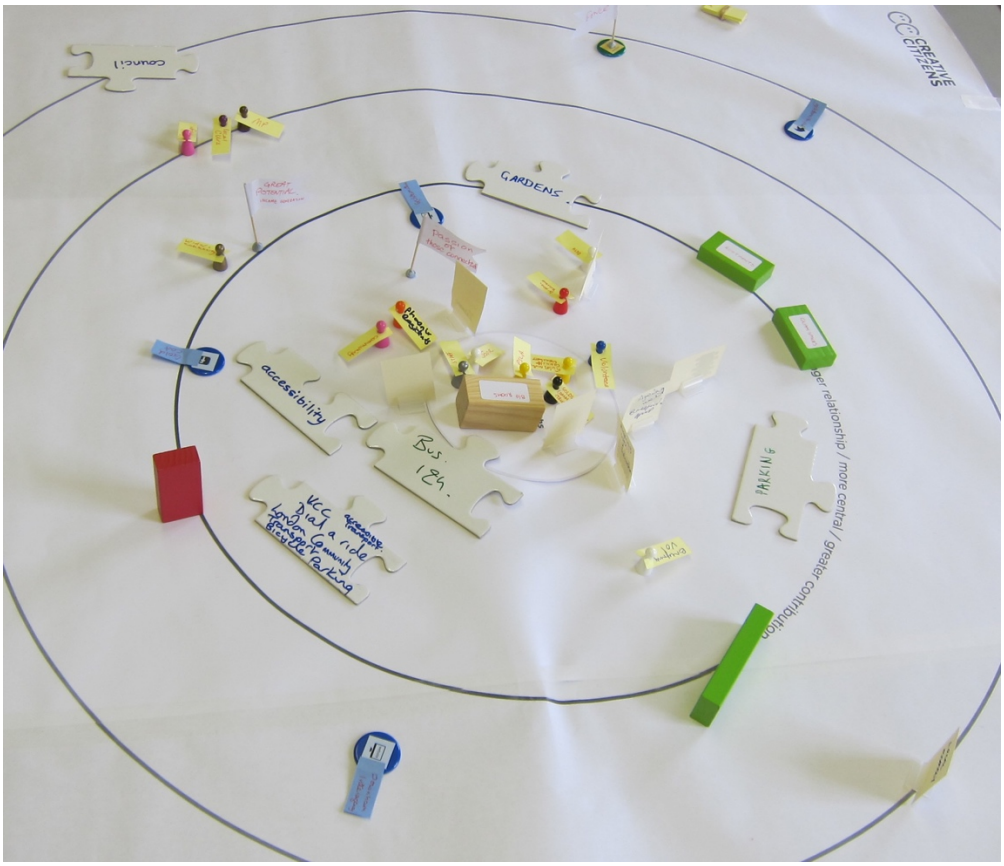

Figure 1: an example asset map

Asset mapping is delivered through a facilitated workshop were the participating group is invited to imagine that their project is at the centre of the map and to prioritise different assets at their disposal, according to how central/important they are to the project, or how easily they can be mobilised. Assets at the centre are more active or important; assets at the periphery can be seen as untapped or potential assets. The facilitator helps the group identify, explain and negotiate their assets, their importance, and their relationship to one another.

The method includes different techniques that may be used in combination with one another at different stages. Participants may create a *collective map of current assets* by negotiating the value of each asset, its position and its relationship to other assets. *Individual maps* can also be created to capture personal values and individual connections to different assets. Individual asset mapping asks participants to place themselves (rather than the project) at the centre of the map and consider their own roles and connections with assets on the collective map. Finally, a *potential assets map* can be constructed collectively to identify missing or underused resources, and to kick-start the generation of a common vision and ideas for new projects and potential solutions. While group maps are representations of consensual ideas about a community's assets, a personal asset map helps to explore individual perceptions of assets, which may or may not be shared among the whole group and which may help reveal conflicts and multiplicity of perspectives. It also provides a personal thinking space for individuals to understand their own role and potential contributions.

The use of physical props that can be moved around, redefined and repositioned was found to be important for facilitating active, playful and creative engagement. Assets become more tangible as they are externalised and become literally graspable, while at the same time they become more negotiable, as they can be renamed, repositioned, combined and even discarded.

Relationships among assets are captured in different ways. Assets in the same circle are loosely related in terms of their importance, but participants were also encouraged to consider explicit relationships between assets by clustering them together, combining them, or moving them further apart. Relationships might include conceptual and geographical links, business or working relationships, personal connections and social bonds. Relationships are also captured through personal asset maps, where individuals reflect on their connections with assets identified on the collective map and the strength of those connections. Implicit relationships are also identified by aggregating information on the individual maps (where for example a person is found to be connected to an asset through another person). For a more detailed exposition of the method Alexiou et al (2016).

3.1.1 How this method builds people's capacity to co-design

Observations recorded by the research during the asset mapping exercise, combined with participants' self-reflections and feedback provided through conversations and evaluation questionnaires after the event, helped identify different ways in which the exercise supported participants in their co-design tasks.

Used at the beginning of the co-design process, the asset mapping exercise helped participants make sense of their situation collectively and to establish a vision and a common understanding of this vision. More specifically, by identifying and negotiating assets and their significance participants developed a shared coherent understanding of their current situation and objectives by taking into consideration a variety of parameters. Ideas for activities to help promote their objectives also formed, through a consideration of potential and existing assets and relationships between them. Prioritising assets also played a strategic role in design decisions, helping participants to articulate a vision about what is important for future action and start establishing a plan of next steps.

Additionally, it was revealed that the approach had a role in facilitating collaboration and creativity. Giving everyone an equal opportunity to add an asset and rationalise it before opening it up to discussion was useful for establishing a level playing field, avoiding dominance from those most central to the project or too much focus on the 'correct' or 'established' view, thus making innovative insights and connections more likely to emerge.

Most importantly, asset mapping proved to be an important reflection vehicle: it provided the environment for participants to not only examine their project, but also to contemplate about and build on their own values, aspirations and capabilities.

For example, one of the participating place-making communities is an activist group opposing the demolition of a local market which houses a large Latin-American community. The asset mapping exercise was catalytic in shifting attention from opposition to productive acts. Rather than focussing on their usual activity of opposing the existing plan, they focussed on their own alternative community plan, on the process of visualising, communicating it in more detail and drawing further support for it. By mobilising and developing their own creative capacities two people from the group were able to construct a 3D virtual tour of their place in Stickyworld Inc and take it to their community for feedback. At the time, their proposal received enthusiastic support and 222 comments on the Stickyworld fed into the consultation process which saw their plan approved by the local council in 2014.

Co-design capability is however to be considered as something that goes beyond technical aspects of design. While the activist group mentioned above was able to draw on existing technical 'design' knowledge (3D visualisation, technical drawing), in other cases, technical design expertise was necessary to be injected into projects. For example, technical making and software design expertise was brought in another case, to support the creation of a 'story booth' within a community centre, however, this was seen as an input to a collaborative process where different stakeholders or experts come together to make things happen and to achieve something that they wouldn't be able to achieve without each other (see Greene et al, 2016). We came to understand that co-design capability relies heavily on the capability of connecting knowledge, skills and resources to carry out a design.

3.1.2 What have we learned about co-design

By collecting information about the assets and relationships among assets as those were recorded by the nine different groups, it was possible to draw some more general conclusions about the types of assets that are important for co-design.

For example, from a total of 360 assets identified in the asset maps of the nine groups who undertook the exercise, 53% were found to fall under two of the seven asset categories: people and groups and businesses (i.e. relationships and connections to other individuals, and formal and informal groups and organisations). These two types of assets were also predominantly at the centre of the maps. This signifies the importance of such intangible assets both as motivators and as vehicles for carrying out co-design projects. Mobilising these assets however, often came through engagement with other types of assets – particularly media (both social media and more traditional avenues such as printed media) and local places who play a catalytic role in generating and nurturing social relationships and a sense of identity and belonging.

Beyond looking at the maps themselves, recording, transcribing and analysing people's arguments and narratives was important for understanding group dynamics as well as

people's perceptions, motivations and practices that influence co-design. The maps and discussions helped uncover different organisational/governance structures, and different values and principles driving citizen led co-design practice. For instance, the activist group mentioned above had a strong social capital built on numerous connections with other groups and organisations which were distributed among its members, while another of the groups that took part in the project, a creative youth network focussed on music and video storytelling, was more reliant on personal connections and a growing 'gift economy' developed between friends. People's narratives around assets and the things they value, also revealed that some practices seemed to emerge from a sense of threat and an orientation or commitment towards democracy, such as in the case of the activist group, while other practices seemed to emerge from a sense of opportunity and an orientation or commitment towards innovation, such as in the case of the hyperlocal journalists and the creative network (Zamenopoulos et al, 2016).

3.2 Challenges-Assets-Opportunities

The challenges-assets-opportunities method built on the experience of the asset mapping method (and in accordance with ABCD theory and principles) but was developed with a different research question in mind and for a different co-design context. While the objective of combining research and action was the same, the method was used exploratively to help explore barriers and opportunities for design in the context of historic places of worship. The participants were groups who look after historic places of worship and have the need or aspiration to make changes in the building to better serve the needs of their local communities. The method was developed through mock exercises with research project team advisors and different aspects of the method were trialled with places of worship in conjunction with other activities.

The purpose of the method was to unearth challenges and assets that participants had, with a focus on helping them switch their frame of mind from the problems they face, to the opportunities that exist to overcome them through the mobilisation of existing assets.

The method uses the New IDEAS Hexagon tool developed by Imagination Lancaster, which consists of different coloured hexagon cards that can be connected at their corners to make associations and relationships in multiple directions. The different colours are used to represent each of the three themes of challenges, assets and opportunities. In addition to the hexagon cards, the toolkit includes a set of stickers that helps participants think about different types of assets (or lack of them) and make them visually explicit. Rather than the longer list of assets used in the asset mapping method, assets are grouped under three headings: people & connections (which includes skills and knowledge as well as relationships with other groups and organisations), resources & tools (which includes spaces, infrastructures, natural and financial resources), and values & emotions. Values & emotions was a category formulated in order to specifically help draw attention to and investigate people's motivations and underlying principles and perceptions of themselves and their community. This was particularly important for these projects as they encompass a complex entanglement of faith, heritage and community values and purposes.

Figure 2: an example map of challenges, assets and opportunities

The method is delivered as a workshop that brings together members from different groups in conversation with one another. Each team is first asked to consider their challenges and place them on the table discussing the roots to these challenges and making connections between them. Participants are then asked to add their connected assets onto this tapestry, before moving into imagining new opportunities that exist to utilise certain assets to address their challenges. Key to this exchange is having another team act as critical friend, helping their peers to externalise and clarify their thoughts and visions, often providing advice, creative input and inspiration. Besides the critical friends, each table has an academic facilitator and a (heritage) professional sharing their knowledge and experiences. The exercise has two rounds, and people rotate around the tables so that every team has the opportunity to share their project as well as act as critical friend to another.

3.2.1 How this method builds people's capacity to co-design

Feedback collected from 10 participants after the session point to a number of key outcomes. Participants found that the session helped them to look at a familiar situation in a different light or consider it from a broader viewpoint. They found that the ability to compare their own project and experience with others was valuable in many respects: on one hand they were able to understand they are not alone in their ventures and that the problems they face are surmountable, and on the other hand, they were able to reflect on their own individual identity and unique purpose and objectives. They also valued the structured approach that geared participants towards solutions and specific steps they need to take. The feedback established that the approach also built the participants' collaborative awareness, not only about the value of learning from other examples and projects, but also the value of engaging more people in understanding their situation and formulating a vision for their place.

Of the eight groups that took part in the workshop, three came back to the research team with further requests for support during their design process, particularly to learn how to engage the wider community (beyond their congregation) in decisions about the future of their place. At the time of writing one of them (a church near Stoke on Trent) has secured a grant from Heritage Lottery Fund which allowed them to complete a project to repair the building (and move it out of the heritage at risk register) and to convert part of the interior into a heated space that can serve both as a community hub as well as a worshiping space. An interview conducted with the vicar who led the project revealed that the workshop was instrumental in switching their perspective about what is possible and adopt a constructive attitude towards the building (see Brockwell, 2018).

3.2.2 What have we learned about co-design

The method helped collect information about the kinds of challenges these groups face in their co-design endeavours and the kinds of assets they have in their disposal. This is useful knowledge *for* the design process. However, crucial knowledge *about* design was uncovered through the process of switching from thinking about challenges to thinking about assets.

Participants found it easier to talk about problems (351 challenges were recorded across tables, as opposed to 235 assets) however the move from challenges to assets deeply transformed the perception of the task at hand. Some of the elements previously recognised as challenges, were re-interpreted as assets: for example, historic and other architectural characteristics of buildings which were previously discussed as challenges, now were seen as positive elements, associated with beauty and a sense of identity and attachment. Additionally, while some cultural and social challenges were originally identified (such as difficulty communicating the faith and social mission of those places and dealing with statutory bodies), these were overshadowed by the abundance of cultural and social assets available to the groups, such as a sense of community, and relationships and partnerships with other organisations (such as schools, charities and local businesses).

Finally, the method was very useful in creating a picture on how people think when identifying opportunities for future design work. The eight places of worship identified a spectrum of different opportunities but predominantly opportunities related to the development of cultural and social events and connections. 56% of these opportunities were ideas for actions (e.g. the organisation of events, local exhibitions, heritage trails, educational activities) and 44% of these opportunities were general objectives or principles (e.g. make the space a safe place, be the centre of community life).

Despite this switch from problem-based thinking to constructive thinking, analysis of the tapestries created and the discussions around them, showed that there were far more challenges than assets, and the opportunities created, although clearly built on assets available, were rather generic and did not eventually seem to address some key challenges. This along with the significant relative number of objectives and principles generated revealed to us that groups required more time dedicated to sharing, reflecting and agreeing on underlying principles to drive a project forward.

4 Summary and discussion

We discussed two different methods that have been employed with community groups to both build their capacity to carry out design tasks and to help investigate their co-design practice. These two objectives are obviously related, as better understanding of what makes

those non-expert groups capable to design, can in turn feed into the development of methods to support co-design.

Both methods were based on the principles of asset-based development which focusses on unearthing and mobilising the intrinsic capabilities and resources of people as a means for engendering change. Taking both methods together we can make some overarching observations *about* co-design in this context. We saw for example that there are different reasons and ways in which those groups come together to carry out a project, but in any case, human, cultural and social assets are crucial motivators and also vehicles of co-design. In particular, the sense of community and belonging, and the ability to build relationships and partnerships with a wide range of other groups and organisations were key. We saw that the methods were useful when they supported people not only to understand their situation and generate design ideas and actions, but also when they were supported to work together in those tasks.

In light of these observations, it is perhaps useful to view co-design capacity as consisting in three key interrelated capabilities or dimensions: creativity, collaboration and reflexivity. Here we take a distinct broad view of creativity - rather than focussing on originality or innovation, we associate creativity with the capability 'to create', to bring something into existence, but also with 'resourcefulness', the capability to find clever, apt ways to overcome difficulties. We also take a broad view of collaboration, which may include working together on a common goal, working together on separate goals, or just connecting knowledge and expertise to pursue a set of objectives. The key capability is to recognise the knowledge, skills and resources that others can bring and find ways to draw them together to achieve something that no-one alone can achieve. Finally, reflexivity is obviously the capability to take stock of one's own situation, as an individual and as a group, and re-evaluate and re-formulate individual and shared principles, objectives and understanding.

When talking about co-design and design capacity more generally, it is important to consider the role of domain design knowledge, specialist knowledge and skills that allow things to get done in practical terms. In the cases we discussed, this included for example software design knowledge, knowledge of 3D modelling, or knowledge about architectural preservation, as well knowledge about the building design/planning process. In some cases, this knowledge was present or needed to be developed within the community, in other cases, it was brought in the project in the form of specialist advice. While the development of such domain design knowledge is important, its importance should be seen in the context of the three capabilities or dimensions, as an asset fuelling or facilitating creativity, collaboration and reflexivity.

We would like to conclude this paper with one final note about the methods presented, which constitute a particular species of design research. While we argued about their usefulness in understanding co-design practice and building co-design capacity, our aim is not to suggest that this species of design research is more advantageous than others or that it should be the norm. We see that these methods are part of the 'arsenal' of design research that can contribute to enriching design research and its impact on civil society and creative citizenship.

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